THE FARTHEST SOUTH.[1]

IT is with a feeling of disappointment that one learns that the name of Tierra del Fuego does not carry in it the tradition of the volcanic fires which, though once seen by man, are now nearly all extinct; but we are told that the name was given by Magellan because of the immense number of fires lighted by the native Indians to keep themselves warm or cook their food, or give notice of the approach of strange craft. All the descriptions of the country connect it in climate with Chili, the land of snow, as its native name implies, and give greater prominence to its glaciers and icebergs than to its one still active volcano.

Fitzgerald has given a fuller account of the exploration of the same region as that traversed by Sir Martin Conway, and the aspects of Nature which struck both these travellers we may regard as characteristic of the region.

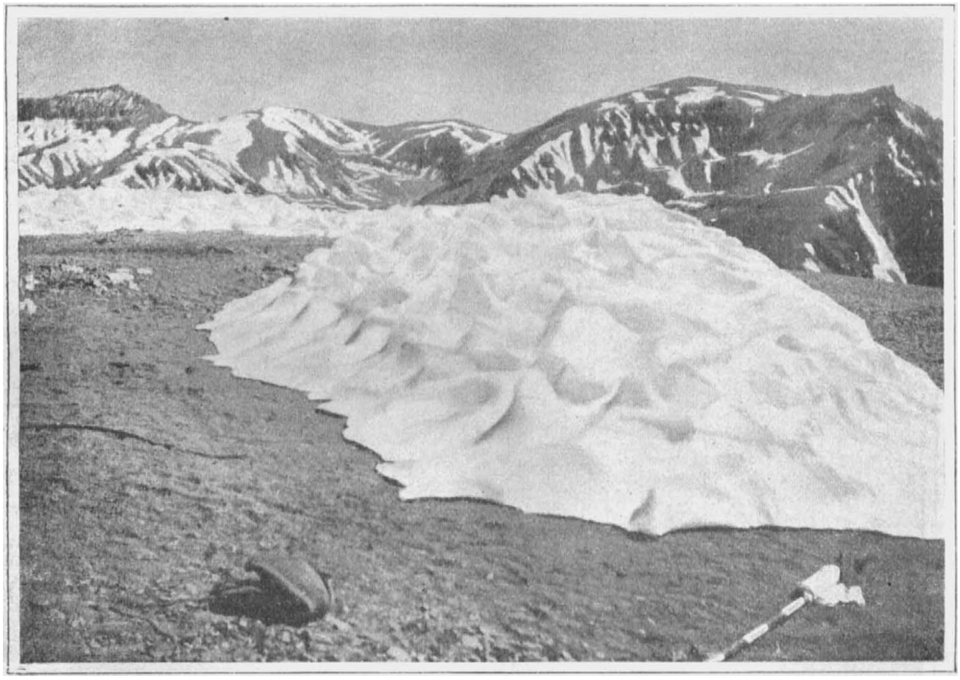

FIG. 1.—Nieves Penitentes in Process of Formation. (From Conway's "Aconcagua and Tierra del Fuego.")

Many of the accidents and incidents, often very untoward, which befell them both may be expected as inevitable accompaniments of exploration at great elevations, while others may be provided against when the traveller has realised what is before him and taken due precautions. Both watched the purple shadows creeping over the ocean, the gorgeous colours of the rocks and the deep blue of the ice. Both tell us of the rapidly rising torrent which carried off mule and man, of the glissade of the ponies down the steep talus of crumbling stone, of the struggle and recovery of the mule on the slippery rocks, of the frost-bitten guide, the mountain-sickness and other discomforts arising from impaired circulation and the want of constant supplies of warm and nourishing food, of the difficulties of the dense forest and spongy ground; and this similarity of experience and consensus of opinion warns the future traveller who may try those heights what to look out for and what to prepare for.

Sir Martin Conway's diary, in its description of details, gives a freshness and local colouring to the story; even his constant references to the weather, by which, in such cases, the best-laid plans are often thwarted, do, in spite of Mark Twain's grumble, help the reader to realise the nature of the enterprise. Perhaps this remark would apply less strongly to his introduction of unexplained Spanish or native words with which his readers could not be expected to be familiar. We certainly do feel that we are reading about a foreign country when we come suddenly upon alameda, alfalfa, arriero, or pejerey, peon and posado. They have their effect, like "that blessed word Mesopotamia"; but we lose the thread of the story if we do not know whether our traveller has arrived at a wayside inn or a position of equilibrium at the bottom of a crevasse.

Darwin, in the "Voyage of the *Beagle*," has described the features of this interesting region more especially from the scientific point of view; Sir Martin Conway often helps us greatly to realise the general effect by pointing out that it is like something nearer home which his readers would probably have seen.

It is an interesting region. The double range of the Andes carved into every variety of peak and valley is submerged at its southern end so that the deeper hollows have been invaded by the sea, which fills a long trough parallel to the coast-line and many a transverse channel. He compares it to the Norwegian and Alaskan inland steamboat routes (p. 141). The submerged mountains are attacked by air and ocean with almost ceaseless fury, and we learn that it is not always safe to assume, when we see the tops of a group of mountains all touching an approximately uniform level, that we have there the wreck of a sea-plain or, as some would call it, a plane of marine denudation or base level of erosion, out of which the separating valleys have been carved after its upheaval, for here we have an example of a mountain region being submerged and the heights during any stationary period being planed off to a uniform level, the valleys having existed previous to the submergence.

The mountains around still rise so high that their snows feed glaciers which descend to sea-level. Before the submergence, their greater ice-flows crept further out on to the lowlands and left traces of ancient glaciation far beyond its present limit.

How recent some of the great geographical and climatal changes of the southern end of the Andes are, we may learn from a comparison of what the glaciers of Sarmiento were like when Darwin visited the straits and the same glaciers as seen by Sir Martin Conway. In

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[1] "Aconcagua and Tierra del Fuego." By Sir M. Conway. Pp. xii + 252. (London: Cassell and Co., Ltd., 1902.) Price 12*s*. 6*d*. net.

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Darwin's time, they actually ended in the water, now they are cut off from the channel by belts of densely wooded moraine. The former greater extension of the ice is also shown by the way in which "the graceful ice-rounded foundation rocks of this and all the other mountains around slope up to the cliff and jagged arrêtes above" (p. 199), and proofs of oscillations of level are seen in the raised beaches and iceberg-carried boulders near Otway Water (p. 219).

Aconcagua (pp. 71, 72) towers into the sky, the grandest peak of the southern Andes. It appears to be built up of approximately horizontal beds of volcanic rock of different texture, hardness and friability, which are carved into steps like those which gave their name to the "trap" rocks of Sweden. The steps are better preserved towards the right- and left-hand sides of the slope than in the middle, where the downward drift of débris and the fall of avalanches are most common. The edges of the steps are there completely worn away and buried. The flow of débris down the face is such that the fragments tend to become rounded or subangular, like pebbles in a brook by their friction against one another. When he was descending the mountain, the stones at one point (about 20,500 feet up) poured away beneath his feet and disclosed the subjacent rock, which he perceived to be ground quite smooth by the passage of the débris over it.

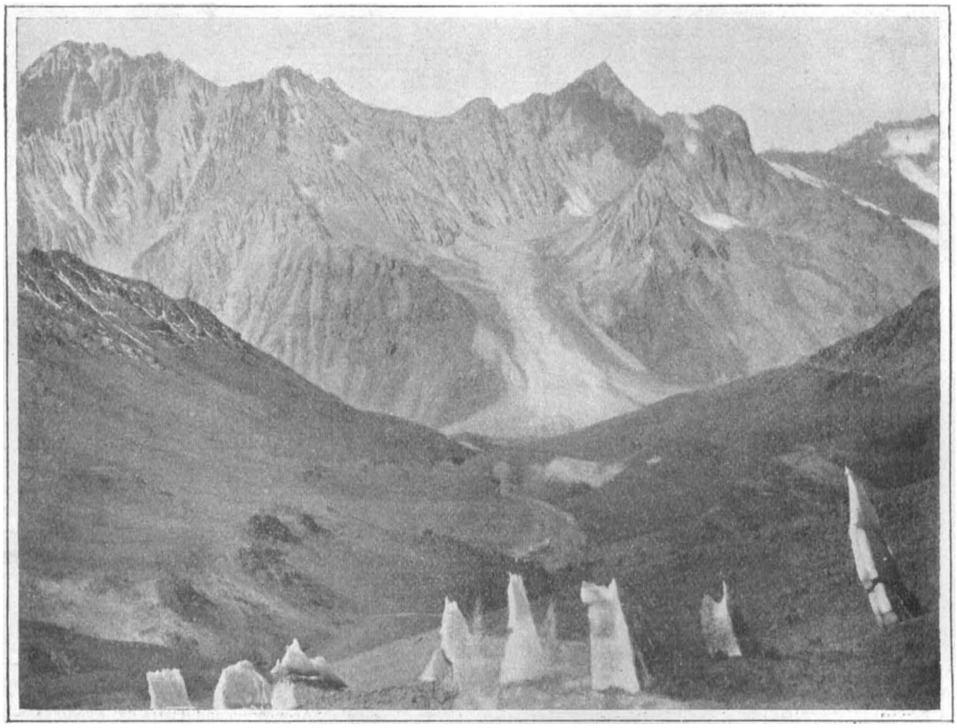

Fig. 2.—Nieves Penitentes; the last stage. (From Conway's "Aconcagua and Tierra del Fuego.")

Sir Martin gave some time to the examination of those curious remnants of great slipped or drifted masses of snow, the *nieves penitentes*, so called because they stand like devotees enveloped in shroud-like robes doing penance. They require peculiar conditions for their full development, and therefore, although somewhat similar pillar-like remnants of melting snow may sometimes be seen even in this country, they are not common anywhere in the Old World and only over limited areas in South America. They are cut out of avalanche snow which has been subjected to pressures roughly perpendicular to the direction of its fall, and thus hardened into approximately vertical strata of different densities. The wind has nothing to do with their origin, but they are carved out by the melting action of direct solar radiation. They are roughly elliptical and somewhat bent over to the north, the major axis of the elliptic sections being oriented east and west. On searching for *penitentes* in different stages of development, he found that a thick bed of well-compacted snow, when exposed to the action of the sun, soon becomes pitted over with little saucer-like depressions, and the deeper these become, the less power has the sun's rays upon their sides and the more upon the bottoms of the depressions. The hollows enlarging ultimately run into one another, leaving rough pyramids of snow standing up between them, until at last the ground is reached; the spires are entirely separated from one another and are seen standing about on the stony floor like separate sugar cones.

There is also a mountain called Penitentes (p. 108), from the weathered-out columnar structure of the rocks which form its summit, not unlike what we sometimes see in our strongly jointed Mountain Limestone or Millstone Grit.

Many other curious questions arise out of an examination of such an area; for instance, the great unconformity (p. 105); the inosculating valleys (pp. 127, 131); the landslips and rock creep, or rivers of mud and stone, similar to those described by Heim in Switzerland; the moraines modified by blown sand (pp. 55, 56).

So little has been done towards the exploration of those strangely varied and, for most people, inaccessible regions that we gladly welcome Sir Martin Conway's diary of his adventurous journey through southern Chili and Tierra del Fuega, and of his difficult climb and almost equally dangerous descent of Aconcagua and Sarmiento.

T. McK. H.

SECONDARY AND TECHNICAL EDUCATION.

Now that the Education Act has become law, one of the first duties of the newly constituted local authorities will be to determine what are the educational needs of their districts and how far these needs are met by existing institutions; they will then be able to decide in what directions increased educational facilities are needed and how they can most efficiently provide what is wanted.

It is in the domain of secondary education that such a survey as is foreshadowed above is likely to form most

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